REMARKS

Claims 1-32 are pending.

I. Claim Amendments

The preamble of Claim 1 and its dependent claims have been amended to improve readability.

Claim 2 has been amended to recite the natural and artificial aging.

Claim 2 has been amended to be clearer.

Claim 19 has been amended, and new claim 23 added, to recite a distortion feature supported at page 5, paragraph [0023], of the present application. Claim 19 has also been amended to recite and a lack of regions of differing inner stress levels as supported at page 3, paragraph [0011] disclosing avoiding regions of differing inner stress levels; and page 5, paragraph [0019] disclosing the inner stresses or residual are released throughout the artificially or naturally ageing step performed after the shaping step.

Claims 20, 21 and 22 have been amended to improve readability.

New Claim 23 recites a distortion range from Claim 16.

Claim 24 recites an exfoliation resistance supported at page 7, paragraph [0029].

Claim 25 recites tempers and distortion ranges supported at page 10, paragraph [0047].

Claim 26 is supported by Claim 1. Claim 27 is supported by Claim 2.

Claims 28-31 are supported by original Claim 1, Claim 2 and the bending step described at page 5, paragraph [0021].

Claim 32 is supported at page 7, paragraph [0029].

It is respectfully submitted no new matter is presented by the above amendments.

II. Information Disclosure Statement

Applicant notes the assertions in the Office action regarding the German document listed in an IDS form.

III. Drawings

The drawings have been amended as requested by the Office action. The amendment of

Fig. 1 to state Prior Art is not an admission that all such metal structures represented by this shape are prior art. For example, as the Examiner knows, metal products can have different microstructures and other characteristics which are not prior art even if they look similar on the surface to a prior art product. Replacement Sheets including these changes are provided in ATTACHMENT I.

IV. Specification

The abstract and disclosure have been amended as requested by the Office action.

V. Claim Objections

The claims have been amended as suggested by the Office action in response to the objections to Claims 1-22.

VI. Claim Rejections – 35 USC §102

Claims 19-22 are rejected under 35 USC §102(a) as being anticipated by Applicant's Admitted Prior Art (AAPA). This rejection is respectfully traversed.

Claim 19 has been amended, and new Claim 23 added, to recite a distortion range and a lack of inner stress. It is respectfully submitted the product of this product by process claim is different from that of the prior art because this combination is neither taught nor suggested by the AAPA.

The AAPA explains it is known (and disclosed in the application in paragraph [008]) to age the plate forming to fuselage before the attachment or machining of the ribs. As set out in the application in paragraph [009] the bending and the machining results in considerable distortion. This is further illustrated in the Example in paragraph [0048], where the plate has been aged to a T351 temper prior to bending and is not (further) aged after being bent.

In contrast to the AAPA, the present invention ages after shaping or forming. The present invention shapes or forms, e.g., bends, a plate to form a curved or shaped structure, then the shaped structure is aged (e.g., preferred modes of ageing are recited by claims 2 and 3), and then if desired is it machined into an integrated monolithic structure (Claim 26 recites this machining). This present invention's ageing after shaping or forming is in addition to other ageing that may have occurred before shaping or forming, for example according to claim 8

The AAPA discloses two methods of prior art processing.

In a first method, the product is bent and stringers or beams are attached as discussed in paragraph [007]. The resulting product from this method has the disadvantage that, as explained at pages 2-3, paragraph [009] it displays considerable distortion after the bending and machining operation thereby showing a vertical and horizontal distortion which makes the assembly of the aircraft fuselage or aircraft wing cumbersome. As explained at page 8, paragraph [0042], "When the additional components 2 are attached to the base sheet 1 and when the whole structure is finished after the machining and riveting or welding step, a horizontal distortion d_1 and/or vertical distortion d_2 usually results from stress relief from the pre-curved plate or sheet which has been bent before additional components 2 are connected to the base sheet or before components 2 are machined from a plate product with a corresponding thickness." This stress release is not aging.

Stress relieving is different from aging because stress relieving involves heating a product for a short time period at low temperatures. Aging takes longer and is done in a controlled manner to achieve desired strength and corrosion resistance. In particular, artificial aging is performed at higher temperatures than the stress relieving mentioned for the first method of the AAPA.

In a second method, a plate which has been previously heat treated and then bent and then a portion of the bent plate is machined away to form stringers and ribs and beams. As explained by paragraph [009] this bent and machined structure comprising sheet and stringers or beams displays residual or inner stress originating from such bending operation and results in regions with less or more internal stress. Those regions with an elevated level of internal stress tend to be more considerably susceptible to corrosion and fatigue crack propagation. As further explained at page 9, paragraph [0043], "A disadvantage with this approach is that there may be significant residual stress in the product, and this may lead amongst others to increasing the cross-section of frame members or the skin itself to meet required tolerances and safety requirements." As shown in the below-discussed example, the bent plate prior to machining suffers from distortion and residual stress. It is respectfully submitted that, after machining the bent plate to the desired shape, the residual stress remains.

Thus, the product of the first method suffers from distortion. Moreover, the product of the second method initially suffers from distortion and residual stress and, even after machining, suffers from residual stress. In contrast, the presently claimed product simultaneously avoids distortion and residual stress.

Moreover, data at pages 9 and 10 of the present application shows the unexpected advantages of the present invention by comparing the following:

a product of the present invention, namely a plate in a T451 temper bent to a structure with a 1000 mm radius followed by artificial ageing to a T351 temper; with

a comparative product, namely a plate in the T351 temper bent to a structure with a 1000 mm radius and not further aged.

This comparative product is representative of a product processed according to the second prior art method, but not yet machined. The machining would not remove residual stresses in the metal remaining after machining.

The comparative product is also representative of a product processed according to the first prior art method because the distortion caused by bending a plate would also arise in the first prior art method which includes a plate bending step.

The data at paragraph [0048] shows the comparative example has a longitudinal distortion of 0.15 to 0.22 mm which can be calculated to a residual stress in the longitudinal direction of 49 to 54 MPa. In contrast, the distortion in the product of the present invention has a longitudinal distortion of 0.07 to 0.09 mm which can be calculated to a residual stress in the longitudinal direction of 16 to 22 MPa. This is unexpectedly lower.

VII. Claim Rejections – 35 USC §103

A. Applicant's Admitted Prior Art (AAPA) in view of Sanada et al.

1. It is improper to combine AAPA and Sanada et al.

Claims 1-10 and 12-17 are rejected under 35 USC §103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of US 6,606,895 to Sanada et al.

It is respectfully submitted it is improper to combine the AAPA with Sanada et al. Sanada et al., col. 2, lines 1-2, discloses annealing an upset and formed cylindrical-shaped member. Sanada, col. 3, lines 39-40, discloses cylindrical member 10d is placed in a furnace and heated to 700 to 800°C to lessen residual distortion in the cylindrical member 10d by annealing.

The Sanada et al. 700 to 800°C annealing step is inoperative for aluminum alloys of the AAPA because they would be expected to melt in this high temperature range (See ATTACHMENT II, Position Paper 3- Aluminum and Fire, page 2, Aluminium Federation Ltd.) which discloses aluminum alloys with a melting point in the range of 600-660 °C). Thus, it is improper to combine this reference with AAPA.

2. Claim 2 further distinguishes over the combined references

Presently amended Claim 2 recites natural or artificial aging. New Claim 27 recites artificial aging. Thus, they further distinguish over the 700 to 800°C annealing step of Sanada et al.

Aging is a process typically performed after solution heat treatment (SHT) and quenching. Applicant notes page 5 of the present application mentions quenching from SHT temperature, then stretching the plate, and then performing a shaping or forming operation. Age hardening is achieved either at room temperature (natural aging) or with a precipitation heat treatment (artificial aging). (ASM Specialty Handbook Aluminum and Aluminum Alloys, page 309 (1993)(ATTACHMENT III). In some alloys, sufficient precipitation occurs in a few days at room temperature to yield stable products. Precipitation heat treatments (artificial aging) generally are low-temperature, long term processes. Temperatures range from 115 to 190 °C (240 to 375 °F); times vary from 5 to 48 hours (ASM Specialty Handbook Aluminum and Aluminum Alloys, page 311 (1993)(ATTACHMENT III). Page 5 of the present application mentions a number of tempers achieved by artificial aging.

Moreover, ASM Specialty Handbook Aluminum and Aluminum Alloys, pages 319-320 (1993)(ATTACHMENT III) discloses annealing for aluminum alloys at different conditions than those disclosed by Sanada et al. and hence not combinable with Sanada et al. Aluminum annealing comes in various types that differ in objective. Aluminum annealing categories include full annealing for both non-heat treatable alloys and heat treatable alloys, partial annealing for only cold worked, non-heat treatable alloys, and stress-relief annealing for cold worked wrought alloys (ASM Specialty Handbook Aluminum and Aluminum Alloys, pages 319-320 (1993)(ATTACHMENT III). One type of full annealing which makes the softest alloy is "O" temper. Annealing of aluminum alloys is at a higher temperature than artificial aging. For example, typical aluminum alloy annealing temperatures range from 230 °C (450 °F) to 500 °C

(825 °F). Thus, even these annealing processes operate at temperatures above those of natural or artificial aging of aluminum alloys.

3. Claim 3

Claim 3 further distinguishes over the references. Paragraph 6 discloses it is known to over-age AA7000-series aluminum alloys but this is not at the time presently recited (see paragraph [009] discussing aging plate). As explained in the application, this does not solve the problem created by the bending.

4. Claims 5-7

Claims 5-7 further distinguish over the references because it is incorrect to assert paragraphs 5, 6 or 22 of the present application against these claims. Paragraph 5 mentions tempers but does not appear to mention stretching. Paragraph 6 discloses it is known to over-age AA7000-series aluminum alloys but this is not at the time presently recited and does not appear to mention stretching. Paragraph 22 mentions stretching but it describes the invention, not the prior art. Although not cited, Applicants note that although *Aluminum and Aluminum Alloys ASM Specialty Handbook*, page 317 (1993) mentions using stretching for mechanical stress relief, it also states that "If the benefits of mechanical stress relieving are needed, the user should refrain from reheat treating."

5. Claim 28

It would also be improper to combine the annealing of Sanada et al. with AAPA against new method Claim 28 because the combination would be inoperable for the reasons given above.

6. Claim 29

Moreover, new method Claim 29 recites shaping or forming the alloy plate by bending to obtain a predetermined shaped structure. In contrast Sanada et al. cold forges. It is respectfully submitted the motivation of Sanada et al. to anneal after cold forging from the object having the shape in Fig. 2A to that of Fig. 2C and then punching the object to the shape of Fig. 2D neither teaches nor suggests to anneal after mere bending.

B. Applicant's Admitted Prior Art (AAPA) in view of Sanada et al. and Quist et al.

Claims 1-10 and 12-17 are rejected under 35 USC §103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Sanada et al. and US 4,305,763 to Quist et al.

This rejection is respectfully traversed. It is respectfully submitted Quist et al. does not make up for the deficiencies of AAPA and Sanada et al.

VIII. Conclusion

In view of the above it is respectfully submitted that all objections and rejections are overcome. Thus, a Notice of Allowance is respectfully requested.

Respectfully submitted,

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ATTACHMENT I – Replacement Sheets

IN THE DRAWINGS

Figs. 1, 2 and 3a are amended to be labeled Prior Art

Replacement Sheets including these changes are provided in ATTACHMENT I